dealt with differently in the tables compiled for publication. Of the tables at the author's command, he has chosen that given by M. Hubbard as being, in his judgment, the best representative of the circumstances with which he is immediately concerned.

We cannot, at this point, do better than compare M. Hubbard's figures with those we are familiar with in England, viz. those of the Manchester Unity of Oddfellows and the Foresters. We give, then, the average number of days of sickness per annum at each of the undermentioned ages, as shown by the several tables specified. In the cases of the Oddfellows and the Foresters, the total average sickness in the year is shown in two parts—sickness within six months of its commencement, and sickness counting only beyond this limit. The rules of French Societies generally do not continue aid in money beyond the term of six consecutive months, a large proportion of them not beyond three.

Age.	M. Hubbard	Manchester Unity of Oddfellows : first six months and subsequently.		Foresters : first six months and subsequently.	
20	4·4	4·6	0·3	5·6	0·3
30	5·6	5·2	0·9	5·4	0·9
40	6·0	6·4	1·8	6·9	2·0
50	7·1	9·1	4·8	9·1	4·5
60	11·7	15·0	13·2	13·8	13·1
70	17·1	25·8	44·8	24·0	48·6

A glance at the above table affords sufficient evidence that the author is right in his assertion that sickness tables present very discordant results ; and we should be somewhat failing in our duty if we did not utter a word of caution as to the use of M. Hubbard's tables by unskilled persons, more especially so as the author is inclined to advocate the continued payment of the sickness allowance in prolonged sickness rather than its curtailment. The experience of the Oddfellows and the Foresters may not supply a suitable basis for the calculations of *les Sociétés de Secours mutuels* ; but this experience is extensive, has been carefully tabulated by competent actuaries, and is, at least, worthy the attention of anyone proclaiming, as our author does, the narrowness of existing and available data.

We have not the space to follow the author in detail through the numerous rules and explanations given by him in connection with the calculation of actuarial liabilities and kindred matters. We must content ourselves with an examination of one only, and that a simple one. We propose to consider the method recommended for the calculation of the actuarial liability attaching to the receipt of contributions on account of pensions. As an example, the author takes the case of a member of 47 years of age, who has contributed 10 francs a year since the age of 16, and who is looking forward to a pension of 294 francs 11 centimes to commence at the age of 65. He then proceeds on the basis of the Caisse des Retraites tables, substantially, as follows :—

According to the second of the two tables, an annual contribution of 10 francs, the first payment being made at age 47, secures a pension, to commence at age 65, of 41 francs 35 centimes a year. Whilst, for the same annual contribution, the first payment being made at age 16, the pension is one of 294 francs 11 centimes a year. The equivalent at age 47 of the earlier contributions (from age 16 to age 47) is, therefore, a pension amounting to the difference of the two preceding ones, 252 francs 76 centimes a year. But, according to the first of the two tables, the cost, at age 47, of a pension of 34 francs 53 centimes a year is 100 francs. It follows that the cost of a pension of 1 franc is $\frac{100}{34\cdot53}$ francs, and of 252 francs 76 centimes is $\frac{100 \times 252\cdot76}{34\cdot53}$, *i.e.* 732 francs.

We do not think the tables on which this calculation is based are more convenient in form than those in general use, or that they lend themselves more readily to a simple presentation of the theory of the subject ; and we do not think the method of arranging the calculation is any improvement upon that commonly adopted. Annuity tables intended as aids to arithmetical computation are usually constructed to the unit of annuity, and not to the unit, or ten, or hundred, of contribution or purchase money. A common form of annuity table gives, for each year of life, the present value of a temporary annuity, payable to one of certain ages, say to age 65, accompanied by the present value of a deferred annuity to commence immediately thereupon, the two present values added together giving the present value of a life annuity to run during the whole of the annuitant's life. The ordinary calculation, which may be called the method of present values, then proceeds to estimate the liability of the Society to provide the future benefit, on the one hand, and the claim against the member to provide future contributions on the other :—

Present value, at age 47, of a pension of 294 francs 11 centimes a year, after age 65, is the tabular number (2·90) × 294·11	853 francs
Present value of contribution of 10 francs, payable from age 47 to age 65, is the tabular number (12·10) × 10	121 francs
Leaving the actuarial net liability as before ...	732 francs

The principle of present values which distinguishes the usual method of calculating actuarial liabilities, is quite as easy for the general public to understand as the inverted method of using tables, proposed by M. de Lafitte ; indeed, easier, because of the uniformity with which it is applicable to all cases of annuity, assurance, or sickness contracts. M. de Lafitte himself makes reference to it in explaining the calculation of sickness liabilities. We are of opinion, however, that there is a still simpler way of explaining to the general public the calculation of actuarial liabilities than that depending on the principle of present values. The latter looks to the future, the former to the past. The latter is a prospective method of procedure, the former is sometimes described as a retrospective method. It consists in imagining a number of persons, equal to the number in the table of mortality or sickness, to have actual existence, and to live and die as indicated in the table of mortality, and to fall ill as indicated in the table of sickness, and for the periods mentioned therein. By supposing contributions to be received year by year from all who live to pay them, and the various benefits to be paid out as they accrue due, the amount of money remaining in hand, as thus shown, is the sum that a Society of the tabular number of members should have in hand, and therefore the amount also of the Society's actuarial liability as required. For any other number of members than that suggested by the table, the amount of the actuarial liability would be proportional.

We have confined our observations, in the main, to the subject of actuarial liability, the use of tables of such liabilities, the mortality and sickness experiences on which they are based, and the principles on which they are explained, because the chief object of the book is to deal with this subject and to popularize it. There is, however, a chapter on the due, or fine, or fee, to be charged new members who join at other than the age for which the rates of contribution are arranged ; another chapter on raising the contributions of existing members to provide increased benefits or to meet a deficiency ; another on the mission and the proper sphere of Friendly Societies ; and others beside, all affording excellent reading, and on which, had space permitted, we should like to have said a few words ; but we must conclude this notice. The author manifests an enthusiasm in the work he has undertaken, has expended a great deal of time and thought upon it, and evidently has the welfare of Friendly Societies at heart. If one may judge of literary composition in a language which is not one's own tongue, we should like to express the opinion that the author's writing is clear and attractive. In his efforts to promote and encourage a wider knowledge of the somewhat abstruse subject of actuarial liabilities or valuation reserves, he has our very best wishes.

WATERSPOUTS IN THE HUGHLI.[1]

ON Tuesday, the 4th instant, a fine waterspout was projected from the level vapour-plane of a silvery-edged towering cumulus cloud—or, as our American cousins would term it, a "thunder-head"—over the western side of Kulpee anchorage, and near the village of Jiggerkolly, which, by the aid of a good telescope, showed well the downrush on the inside of the tube, and its counterpart the whirling uprush on its outside, twisting and coiling round and round against the watch-hands (face upwards).

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[1] Reprinted from the *Englishman* of September 13, 1888.

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The day had been close, hot, and breezeless, so far as the surface was concerned, and the cloud in question formed a grateful screen to the afternoon's sun, which was shining brightly north and south of our position; and continued to do so until old Sol hid his face for the night in lower clouds later on. At about 5 p.m., a well-formed waterspout was observed trailing away north-eastward from the cloud's northern verge; then about 40° or 30° high. Near the dense cloud from which it grew its mass was dark and opaque; but from half way down its length to below where it terminated in an unfinished turmoil of jags and rags, it was semi-transparent, the clouds beyond in the background being distinctly seen through it; and there was a light-coloured tube within its gauzy mass which at times was very pronounced and conspicuous.

There seemed to be no commotion on the river or the shore, over which its lower part hung at a height of five or six hundred feet, from the time when it was first observed until it began to wane and draw itself upwards. It was then, when it had shrunk and shortened, that the inside downrush was seen to advantage, and the simultaneous upward whirl around the dense remains of the tube, which, so far as I was able to make out from the motions of the cloudlets, I cannot do better than liken to the turning inside out of a coat sleeve or of a stocking, only the end of the tube was always ragged; and here, where this reversing process was taking place, there was great commotion in the air currents, more especially after the tube had withdrawn itself up to its opaque head.

I had a good telescope, observed these phenomena very carefully, and was on the alert for optical illusions; and, as the upper part of the spout remained intact for a long time after the gossamer-like lower continuation had melted into invisible vapour, I had an opportunity of studying it well.

It was very remarkable to see two or three common kites hovering high up in the vapour plane round and round the dense tube, every now and then becoming hidden behind it as they performed their gyrations, and in the same direction as the ragged fragments of rack or scud which were rushing round and upwards towards the dense head of the spout, until they were actually lost to sight in the very cloud itself.

The "thunder-headed" cloud, from the lower part of which the spout issued, gradually melted away, and grew less gaudy as it dwindled, without, as is usual under similar circumstances, pouring forth a torrent of rain. But there was a double rainbow projected on the clouds banking up over to the eastward, and evidently rain was falling in the space between them and the sun for some time after the last remains of the spout had disappeared, and all was again tranquil aloft.

The following evening, during a heavy thunderstorm and severe squall from the north-east, some twenty miles further down the river, a flash of lightning revealed the existence of a grand waterspout close by. This thunderstorm was remarkable, as it stretched south and north from the pilot station to far north of our position off Kedgeree, and struck both places at nearly the same hour, 7 p.m. Possibly all these phenomena had some connection with the small whirl reported in Mr. Pedler's useful weather bulletin issued daily from the Meteorological Office. The squall itself was seen from an early hour in the evening as a tract of dark streaks hovering ominously high up behind the accumulating white clouds away in the north-east and east, and threatening to quench the light north-west wind blowing in the estuary.

Subsequent information concerning this sudden thunderstorm shows that it was one of the class, referred to lately in NATURE by the Hon. Ralph Abercromby, which extend in an almost straight line for maybe hundreds of miles. It was felt at nearly the same hour all the way from Titighur on the north, to a point forty or fifty miles south of the Hughli Pilot Station—or, say, nearly 200 miles.

S. R. ELSON.

SCIENTIFIC SERIALS.

Journal of the Russian Chemical and Physical Society, vol. xx. fasc. 8.—On the properties of allene, by G. Gustavson and N. Demianoff. The existence of this isomer of allylene ($CH_2 : C : CH_2$) was foreseen since 1872; now, it has been obtained by the action of zinc dust and alcohol on $C_3H_4Br_2$. It is an uncoloured gas, the smell of which resembles that of allylene. It smokes freely when burning.—A note on the atomicity of bore, by G. Gustavson.—On unorganized ferments, by N. Kravkoff, being an inquiry into the properties of pure vegetable diastase.—On a general law of contraction during the formation of solutions of salts, by A. Geritsch. The author comes to the conclusion that the contraction (δ) is proportional to the produce of the respective percentages of water and salt in the solution $\delta = C(100 - p)p$; for Na_2CO_3 the constant C is $= 0 \cdot 0086$, and the contraction calculated by means of the formula for solutions at from 3 to 13 per cent. are very near the contractions directly measured by Gerlach and Mendelejeff.—On the solutions of sulphuric acid from the molecular point of view, by M. Teploff.—On the heat of combustion of stilbene, the mononaphthenes, and some organic acids, by J. Ossipoff.—An apparatus for the demonstration of thermic conductibility, by O. Chwolson.—On a new method of measuring the index of refraction, used by E. Forsch for measuring the same in the lenses of the Pulkowa refractor.—A note on the mutual influence of electrized bodies, by A. Stepanoff.

SOCIETIES AND ACADEMIES.

LONDON.

Linnean Society, January 17.—Mr. W. Carruthers, F.R.S., President, in the chair.—On behalf of M. Buysman, of Middleburg, Mr. B. D. Jackson exhibited a series of careful dissections of *Nymphæa cærulea* collected by Dr. Schweinfurth in Egypt.—Mr. D. Morris exhibited specimens of drift fruit from Jamaica, where he had collected no fewer than thirty-five different kinds brought by the Gulf Stream from the mouths of the Orinoco and Amazon. Although the species exhibited had not been determined with certainty, it was believed to be probably *Humiria balsamifera*, Aud., the flower of which is figured by Eichler ("Flora Brasiliensis," vol. xii. part 2, p. 440, pl. xcii. fig. 1), but the fruit undescribed. It was commonly known in French Guiana as *bois rouge*, and from it was obtained a gum used medicinally and burnt as incense. An interesting discussion followed, in which Mr. J. G. Baker, Mr. Rolfe, and Mr. Breese took part.—Mr. T. Christy exhibited a material felted from Manilla hemp, and waterproofed, very strong and light, and particularly useful for surgical bandages, for which purpose it was highly recommended by army surgeons.—Mr. F. Crisp exhibited some specimens of agate so curiously marked as to lead to the erroneous supposition that they inclosed fossil insects and Crustacea.—A paper was then read, by Mr. J. G. Tepper, on the natural history of the Kangaroo Island grass-tree, *Xanthorrhœa Tateana*. This tree grows abundantly in Kangaroo Island, South Australia, in poor gravelly and sandy soil, intermixed with ferruginous concretions, and attains a height of from 6 to 14 feet, with a diameter of 6 to 18 inches, and a floral spike of from 10 to 19 feet. It is thus a most conspicuous plant, and lends a peculiarly weird aspect to the country it occupies. Its rate of growth is described as very slow, old settlers having remarked but little change in individual trees after thirty years' observation. The most remarkable feature in the structure of the stem is the formation of a dense ligneous central core immediately above and connected with the roots, exhibiting numerous annular zones traversed by transverse (medullary) fibres. The flowers are borne in a dense spike upon a smooth peduncle. Individually they are inconspicuous, of a whitish colour, and develop a strong odour and abundant nectar during the warmer part of the day, when they are visited and fertilized by Hymenopterous insects, the most remarkable being a large metallic-green carpenter-bee (*Xylocopa*), which tunnels out cells in the dead flower-stalks. An interesting discussion followed upon the botanical position of the grass-trees, and the antiquity of the type, in which the President, Mr. A. W. Bennett, Mr. J. G. Baker, Mr. Morris, and Mr. Rolfe took part.

EDINBURGH.

Royal Society, December 17, 1888.—Sir W. Thomson, President, in the chair.—Mr. R. Kidston read a paper on some fossil plants from Teilia quarry, Gwaunyscor, near Prestatyn, Flintshire.—Dr. G. Sims Woodhead communicated an abstract of the results of an inquiry into the causation of Asiatic cholera. The first part (general) was by Dr. Neil McLeod and Mr. W. T. Milles. The second part (with special regard to the reproduction of the disease) was by Dr. McLeod. The disease was shown to be due to the comma bacillus. In forty out of forty-four cases this bacillus was present; while, in a large number of spurious cases, it was only once or twice detected. It was found that symptoms similar to those accompanying cholera in

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